



Soil erosion and sediment yield, a double barrel problem in South Africa's only large river network without a dam

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Soil erosion not only involves the loss of fertile topsoil but is also coupled with sedimentation of dams, a double barrel problem in semi-arid regions where water scarcity is frequent. Due to increasing water requirements in South Africa, the Department of Water and Sanitation is planning water resource development in the Mzimvubu River Catchment, which is the only large river network in the country without a dam. Two dams are planned including a large irrigation dam and a hydropower dam. However, previous soil erosion studies indicate that large parts of the catchment is severely eroded. Previous studies, nonetheless, used mapping and modelling techniques that represent only a selection of erosion processes and provide insufficient information about the sediment yield. This study maps and models the sediment yield comprehensively by means of two approaches over a five-year timeframe between 2007 and 2012. Sediment yield contribution from sheet-rill erosion was modelled with ArcSWAT (a graphical user interface for SWAT in a GIS), whereas gully erosion contributions were estimated using time-series mapping with SPOT 5 imagery followed by gully-derived sediment yield modelling in a GIS. Integration of the sheet-rill and gully results produced a total sediment yield map, with an average of 5 300 t km⁻² y⁻¹. Importantly, the annual average sediment yield of the areas where the irrigation dam and hydropower dam will be built is around 20 000 t km⁻² y⁻¹. Without catchment rehabilitation, the life expectancy of the irrigation dam and hydropower dam could be 50 and 40 years respectively.